HYDROBATIDAE.

62, *Hydrotrechus remigus* Say. Frequent. Hibernates beneath logs and piles of drift along the border of streams. Sometimes seen warm days in latter part of February on the surface of the water.

63, *Limnotrechus marginatus* Say. Frequent. All that I have found in winter were beneath logs on hillsides, 200 yards or more from water.

64, *Limnoporus rufoscutellatus* Lat. This species, abundant on the lakes of northern Indiana, has been found only in small numbers on a large pond in Vigo Co. Two living specimens were found beneath a pile of drift near the border of the pond on Jan. 1, 1893.

The species of Zaitha, Belostoma, Ranatra, and, perhaps, Notonecta, presumably pass the winter as nymphs, inhabiting the mud in the bottoms of ponds and streams; but as I have taken none of them at that season they are not incorporated with the above list of winter Heteroptera, which includes only such species as I have actually found hibernating.

SOME HABITS OF FORMICA OBSCURIPES FOREL,

WITH NOTES ON SOME INSECTS FOUND ASSOCIATED WITH IT.

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It is generally believed and is also stated by the majority of writers upon the habits of ants, that in such climates as we have in our northern States and Canada, the ants just before the ground begins to freeze go down into their burrows below the freezing point, and remain there until the approach of spring, when they ascend again, attend to their accustomed avocations, and repair their nests.

To satisfy myself as to whether or not this were true, I last year located and marked three of the mounds in which this ant lives; they were several miles apart. On November 25 at 3 P. M. I went with my son to nest no. 1. The temperature of the air was 38°, the snow which had fallen on the morning previous had nearly disappeared, and it was gradually growing colder. We removed some of the earth from the top of the nest, and at the depth of six inches we found plenty of ants. They were in a sluggish condition and apparently asleep and when disturbed could barely move about. We continued digging down to the depth of two and one-half feet and found ants huddled together in little piles all through the nest. I took the temperature at this depth, 33° F. The ground froze the following night and remained frozen all winter. We collected 177 of the ants, and brought them home to look for winter parasites on ants. I found 8

specimens of *Uropoda ricasoliana* Berlese. They were all fastened to the tibiae and in every case but one attached to the middle leg. I also found 5 mites of another genus *Laelaps equitans* Michael. I did not observe where they were attached as they became loosened by my handling of the ants. The Uropodas did not loose their grip. We also found one coleopteron *Serica sericea* Burm. hibernating with the ants; it is frequently found with ants in the spring under stones.

We did not disturb this nest again until March 17 of 1895 when we found snow and ice on the top of the nest averaging in depth nearly 5 inches. The atmospheric temperature was 33° F. We cut through the frozen earth which was a little over a foot in thickness and in doing so observed a number of ants. We continued digging to the depth of two feet and found plenty of ants in the same condition as we did on November 25, 1894. The temperature of the nest below the frozen parts was 33° F.* We again collected 42 of the ants for the purpose of examining them for mites and found 4 of the *Uropoda* sp. attached to the legs of the ants as before, but did not find at this time any of the other mites.

On March 23 we went to nest no. 2. Snow and ice was still on the ground, but had nearly all thawed off from the nest. The northern portion of the nest was still frozen, but the other parts more exposed to the rays of the sun had thawed out and were quite wet. Upon removing the soil from the top of the nest we found ants plentiful at 3 inches from the top of the nest. The temperature of the nest at the depth of 8 inches was 39° F. All of the ants were in a sluggish condition, and could move slowly about when disturbed. The temperature of the air was 49° F. and the sun was shining. I placed some of the ants in the sun and in about fifteen minutes they began to appear active. We collected 141 of them for the examination of mites and found 8 of the *Uropoda* sp. We also found another species of ant *Cremastogaster lineolata* in large numbers and but very few of them alive; this species of ant usually occurs under stones and old cord-wood, sticks, logs, etc. Why these ants went into this mound with the other ants I am not able to say. We found a number of the common earth worms, *Lumbricus* sp., two species of *Julus canadensis* Newp., two specimens of a *Porcellio*, a male and female of *Platynus cupripennis* Say, and a large species of staphylinid.

April 6 we made a visit to nest no. 3. Here we found a number of the ants at work; several of the doors were open and the ants moved about quietly, not as they usually do when the weather is warmer and the season more advanced. The thermometer stood at 58° F. and at the depth of two feet down into the nest at 40° F. The day was clear. We found a number of the Uropoda walking around among the ants and some attached to the ants' legs as before mentioned. We found one staphylinid.

* We covered the nest up very carefully after our first visit with the same material of which the nest was composed.

Nest no. 1 measured three and one-half feet across the top and was elevated but little from the surrounding surface, being nearly flat. The ground was of a light sandy soil and situated beside a road passing through a young growth of woods. Nest no. 2 was on the road-side elevated somewhat above the water gutter. It was covered with sod similar to the surroundings and measured three feet across the top and was elevated above the surface nearly six inches; it was a long distance from any woods and composed of a coarse sandy soil. Nest no. 3 measured four and one-half feet across the top and was elevated eight inches above the surrounding surface situated beside a public highway and a long distance from any woods; it was composed of a very light soil covered with small sticks and pebbles and was much the largest colony of the three nests examined.

One of our warmest days last summer, we visited this nest no. 3, approached it carefully, just before 11 A. M. We observed none of the ants coming or going from the nest; its doors were all closed. On removing a little of the loose covering of the nest not more than two inches deep we found the ants in great abundance and to all appearances these ants were asleep.

The ants that we collected in November from nest no. 1 we exposed to a temperature of 26° F. for one hour in a bottle. They immediately collected into a cluster. On taking them into my study which was 72° F. they became quite lively in half an hour. Dr. McCook, who has given much of his time to the study of some of our ants, performed a number of experiments with *Camponotus pennsylvanicus*, and found it to live and to be quite active after being put on ice for forty-eight hours and sluggish at a temperature of 30° F. He also found *Formica rufa* to be active in its nests at 34° F. and both of these species to stand a very high degree of heat. I have also found *Camponotus pennsylvanicus* in hollow trees in the woods imbedded in ice and the decomposed portion of the tree. I have taken them home, thawed them out, and they became lively and appeared well and healthy, and went to work in my artificial nest.

I do not mean to have it understood that all of our ants can or do stand this low degree of temperature, but only that those writers who claim that all of our ants go down below the freezing point in the fall of the year are mistaken and in all probability have never observed these creatures.

There is, however, very little indeed known in this country about our Formicidae in general, there being very few entomologists that have made any study of this group of insects.

In regard to the literature relating to mites found associated with ants, the latest work that I know of is that of Dr. E. Wasmann of Berlin on Myrmecophilous insects found with ants. He mentions 34 Acarina found with ants through the world. I have one-half of this number found in Massachusetts and New Hampshire alone, and expect to find more. The number of ants that I have found to inhabit Essex County, Massachusetts, are 41 species and I have a large part of it to look over yet.